REMARKS/ARGUMENT

Regarding the Claims in General:

Claims 1-21 remain pending. Claims 8 and 18 have been amended to address objections raised by the Examiner. Claims 1 and 7 have been amended as discussed below to address comments by the Examiner in his response to applicant's earlier arguments.

The scope of the amended claims has not, however, been narrowed.

Regarding the Objections to the Claims:

The amendments to claims 8, and 18 should overcome the informalities noted by the Examiner.

Regarding the Prior Art Rejections:

In the outstanding Office Action, claims 1-6, 8-13, and 15-17 were rejected as anticipated by Atkins et al. U.S. Patent 5,570,032 (Atkins), claim 14 was rejected as obvious over Atkins in view of Khandros U.S. Patent 6,064,213 (Khandros), claim 19 was rejected as obvious over Atkins, claims 1, 8, 20, and 21 were rejected as anticipated by Littlebury U.S. Patent 5,008,615 (Littlebury), and claims 7, 18, 20, and 21 have been rejected as obvious over Atkins in view of Spanger U.S. Patent 4,753,863 (Spanger). Except for the rejections based on Littlebury and Spanger, the Examiner has repeated substantially verbatim the rejections from the previous Office Action.

With respect to claim 1, the Examiner states (see second and third paragraphs on page 5 of the Office Action) that the order of the steps is not specified. This is not correct. Claim 1 as previously written called for:

> mounting unsingulated electronic components onto the mounting means;
>
> singulating the components to physically separate them; and
>
> testing the singulated electronic components for defects while they are mounted on the mounting means and without removal therefrom.

This inherently specifies the order of the steps since *unsingulated* components are mounted, the (obviously unsingulated) components are *singulated*, and the singulated components are tested.

Nevertheless, in an effort to advance the prosecution, claim 1 has been amended to make explicit what was previously implicit by adding the word "then" between the mounting and singulating step, and between the singulating and testing step.

Taking into account the inherent (or explicitly stated) order of the steps, this is entirely different from what is taught or suggested by Atkins. According to the patent, the wafer undergoes burn-in and testing *before* singulation (see Col. 6, lines 26-42). According to claim 1, the components are singulated *then* tested - - the exact opposite of what Atkins teaches.

With regard to claim 8, the closest Atkins come to suggesting separation before testing is at Col. 6, lines 53-58, where the patent states that "[p]rior to mating the wafer with the vessel, the wafer may be *semi-scribed or scored* along the die boundaries". However, the patent cautions that "[t]his scribing is not done to the degree where it would jeopardize the mechanical integrity of the wafer and thus the alignment of the wafer pads to the PCB." This is clearly not a suggestion of singulation before testing. Indeed, mechanical separation of the individual dice is expressly prohibited, in order to maintain alignment between the wafer pads to the PCB.

Thus, properly interpreted, Atkins, does not teach or suggest testing of singulated components, and therefore does not anticipate claim 8.

Claims 2-6 are dependent on claim 1 and claims 9-13, and 15-17 are dependent on claim 8, and are therefore patentable for the reasons stated above.

Further with respect to claim 12, contrary to the Examiner's assertion, the cited text at col. 6, lines 11-25 of Atkins contains no reference to or suggestion of rotation. Just because rotating conveyors exist does not mean it would be obvious to use one in Atkins. This is a classic example of using applicant's own teaching as a basis for modifying a reference. The Examiner knows this is not proper.

With respect to claim 14, the deficiencies in Atkins et al. discussed in connection with base claim 8 are not overcome by resort to Khandros et al. Claim 14 calls for:

> . . . a vacuum chuck for holding in position the support frame and film [as recited in claim 13] on which electronic components are mountable, during the singulation, testing and marking.

Although Khandros discloses a vacuum chuck, it does not also hold a support frame and film on which electronic components are mountable. A wafer is placed directly on the top surface [104],

which is similar to the design of Atkins. Accordingly, even if Atkins is modified according to some purported teaching of Khandros, the result will still not meed the terms of claim 14.

Curiously, the previous rejection of claim 19 as obvious over Atkins has been repeated. In this regard, the Examiner's attention is respectfully directed to the fact that claim 19 is immediately dependent on claim 18, and that the previous rejection of claim 18 as anticipated by Atkins has been withdrawn. It is not apparent how claim 19 can be anticipated by Atkins, but not claim 18.

Further, in Atkins, the robot acts on a wafer *per se* (see Col. 5, lines 17-18), and not on a tape which carries singulated circuit elements, and the vacuum arm functions to place the wafer *into* the vessel for testing (see Col. 6, lines 4-5). Neither of these devices act on the mounting means, i.e., the vessel. Moreover, Atkins neither teaches nor suggests using the robot and the vacuum arm to *invert* anything, or to prepare an electronic component for laser marking. The only suggestion for any of this is found in applicant's own disclosure.

In any event, claim 19 is ultimately dependent on claim 8, and is therefore patentable over Atkins for the reasons stated above.

Claims 1, 8, 20 and 21 are not anticipated by Littlebury. Like Atkins, Littlebury does not disclose a method or apparatus which involves completely separating the devices before testing. Rather, the electrical leads are severed from the lead frame, but the circuits themselves remain on the lead frame during testing. (See, for example, column 3, lines 18-27.)

Claim 1 calls for "singulating the components to physically separate them." Since the components in Littlebury remain on lead frame 11, they cannot reasonably be said to be physically separated. Moreover, the Examiner's treatment of the lead frame as "mounting means" is a strained interpretation at best. Unsingulated components are not mounted on the lead frame. Rather, it is the combination of the components and the lead frame which is the unsingulated structure, and at no time prior to testing are the components separated from the lead frame. Thus,. there is no mounting means upon which the unsingulated components are mounted, thereafter singulated, and thereafter tested.

The rejection of claims 7, 18, 20 and 21 as unpatentable over Atkins in view of Spanjer is also not valid. Spanjer discloses a molding material which can be marked by exposing it to a laser beam through a shadow mask. There is certainly no suggestion in this patent of mounting

semiconductor packages on a transparent tape as a holder for the semiconductor devices and for marking the devices by irradiating them through the tape, as required by claim 7..

With all due respect, the Examiner's analysis of Spanjer on page 8 of the Office Action is simply incorrect. The only thing Spanjer teaches shining a laser *through* is shadow mask 14. There is no suggestion that the shadow mask be formed of a transparent tape with an adhesive layer to hold the components.

In response to the previous Office Action, it was pointed out that it would be physically impossible to shine a laser beam through Atkins' tape toward the adhesive surface to mark the components. From the Examiner's comment in the last paragraph of page 2 of the Office Action. it would seem that he does not appreciate why this is so. For one thing, Atkins does not say much about the marking process, but from Fig. 8, it clearly does not take place in the mold as required by claim 7. Secondly, Atkins' tape is on the surface of lower plate 33 in a recess 34. Thus, even if one wanted to employ a laser-markable compound in Atkins, and to mark the surface of the component in contact with the tape by passing the laser beam through the tape toward the adhesive side, it would be necessary for the beam also pass through lower plate 33.

On the possibility that the wording of claim 7 has contributed to the Examiner's misunderstanding, claim 7 has been amended to further emphasize (as in claim 18 discussed below) that the surface of the electronic component being marked is the one in contact with the adhesive surface of the tape. This obviously was always the intent of claim 7, and the additional words are not intended to and do not limit the claim in any way.

Correspondingly, claim 18 specifies that:

> the mounting means comprises a film of transparent tape with an adhesive surface on which electronic components are mountable; and
>
> the laser device is operative to direct the laser beam generated thereby through the film toward the adhesive surface thereof to mark a surface of each electronic component that is mounted on said adhesive surface.

This claim is therefore patentable for the same reasons as claim 7.

Regarding Additional References Noted by the Examiner in a Telephone Interview:

Applicant's representative acknowledges with appreciation the Examiner's courtesy and assistance during telephone interviews on October 7 and October 15, 2003. During these interviews, the Examiner informally expressed the opinion that the amendments made hereby (which were submitted in a proposed amendment under 37 C.F.R. 1.116 which was refused entry because it raised new issues) do distinguish the claims from the references of record. However, the Examiner did refer to several additional references which he considered pertinent to the claims as amended. These were Leas et al. U.S. Patent 5,600,257, Lam U.S. Patent 6,281,046, and EP Application EP 0 918 354.

Nevertheless, study of these references indicates that they are no more pertinent than the Atkins, Littlebury, Khandros, and Spanjer patents previously applied. Lam discusses electrical testing before dicing (Col. 5, lines 19-26) and Leas discloses that the product wafer 18 is un-diced (Col. 13, lines 16-18). European application EP 918,354 mentions that the wafer can be tested, and [thereafter] if desired, separated into individual units for shipment (Col. 10, lines 37-40).

Accordingly, there is still no prior art of record which teaches singulation *before testing*, as claimed herein.

In view of the foregoing, favorable reconsideration and allowance of this application are respectfully solicited.

EXPRESS MAIL CERTIFICATE

I hereby certify that this correspondence is being deposited with the United States Postal Service as Express Mail to Addressee (mail label #EV 343678177 US) in an envelope addressed to: Mail Stop RCE, Commissioner for Patents, Alexandria, VA 22313-1450, on October 23, 2003:

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October 23, 2003
Date of Signature

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Respectfully submitted,

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Please amend the claims as indicated below:

1. (Currently amended) A method of processing an array of electronic components comprising the steps of:

providing mounting means;

mounting unsingulated electronic components onto the mounting means; then

singulating the components to physically separate them; and then

testing the singulated electronic components for defects while they are mounted on the mounting means and without removal therefrom.

2. (Previously presented) A method according to claim 1, further comprising the step of applying markings to distinguish non-defective ones of the electronic components from defective ones after testing while they are still mounted on the mounting means.

3. (Original) A method according to claim 2, wherein the singulation, testing and marking steps are carried out at two or more stations.

4. (Original) A method according to claim 3, including the step of moving the electronic components at least between the testing and marking positions for testing and marking respectively.

5. (Previously presented) A method according to claim 1, which includes the step of detecting the alignments of electronic components before testing, and orienting the array of electronic components as desired before implementing testing.

6. (Previously presented) A method according to claim 2, wherein the markings are applied with a laser device which generates a laser beam, for effecting marking.

7. (Currently amended) A method according to claim 6, wherein:

the mounting means comprises a film of laser transparent tape with an adhesive on one surface;

wherein each electronic component is mounted on the adhesive surface of the film of transparent tape; and

marking is effected by passing the laser beam generated by the laser device through the film of laser transparent tape toward the adhesive surface thereof,

the surface of the electronic component being marked being the one in contact with the adhesive surface of the tape.

8. (Currently amended) An apparatus for processing an unsingulated array of electronic components comprising:

a mounting means for mounting an unsingulated array of electronic components;

a singulating device for singulating the said array of electronic components; and

a testing device operative to test each of the said singulated electronic components for defects;

whereby singulation and testing of singulated electronic components are conducted while they are mounted on the mounting means without removal therefrom.

9. (Previously presented) An apparatus according to claim 8, including an inscribing device for applying markings to distinguish defective and non-defective tested electronic components while they are mounted on the mounting means.

10. (Original) An apparatus according to claim 9, wherein the singulation, testing and marking are carried out at two or more stations of the apparatus.

11. (Previously presented) An apparatus according to claim 10, including moving means for moving the electronic components for processing at least between the testing and marking positions.

12. (Original) An apparatus according to claim 11, wherein the moving means is adapted to move the electronic components in linear and rotary axes, such as an XYZ-Theta table.

13. (Original) An apparatus according to claim 8, wherein the mounting means comprises a film of material having an adhesive on one side and stretched on a support frame, whereby electronic components are mountable on the adhesive side.

14. (Original) An apparatus according to claim 13, wherein there is a vacuum chuck for holding in position the support frame and film on which electronic components are mountable, during the singulation, testing and marking.

15. (Previously presented) An apparatus according to claim 8, including an orienting device to adjust alignment of electronic components and/or to locate the positions of defective components.

16. (Previously presented) An apparatus according to claim 15, wherein the orienting device is an image recognition vision system.

17. (Original) An apparatus according to claim 9, wherein the inscribing device is a laser device which generates a laser beam to mark a surface of an electronic device by heating said surface.

18. (Currently amended) An apparatus according to claim 17, wherein:

the mounting means comprises a film of transparent tape with an adhesive surface on which electronic components are mountable; and

the laser device is operative to direct the laser beam generated ~~therebythrough~~ thereby through the film toward the adhesive surface thereof to mark electronic components mounted on said adhesive surface.

19. (Original) An apparatus according to claim 18, including an inverting device to invert the transparent tape to expose the surface of each electronic component that is mounted on said adhesive surface of the transparent tape to the laser device for marking.

20. (Previously presented) A method according to claim 1, wherein the electronic components comprise molded semiconductor packages.

21. (Previously presented) An apparatus according to claim 8, wherein the electronic components comprise molded semiconductor packages.